22. (NEW) A resin coating method as recited in claim 21, further comprising:

lowering the nozzle so as to attach a bottom part of the ball to the printed wiring board and raising the nozzle so as to separate same from the ball.

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23. (NEW) A resin coating method as recited in claim 22, wherein the imaging is performed by measuring the diameter of the resin.

24. (NEW) A resin coating method as recited in claim 22, further comprising:

spreading the resin ball to a uniform thickness layer; and

determining the amount of the applied resin in accordance with the measured diameter and a correlation table relating to the latter to an amount.

REMARKS

In accordance with the foregoing, the Title has been amended; further, claim 1 has been amended to include recitations of claim 2, namely the features of spreading the resist by centrifugal force and of measuring the area of the spread resist, and claim 2/1 has been canceled. Moreover, claims 6 and 7 are amended to improve form. No new matter is presented, Approval and entry of the foregoing amendments are respectfully requested.

Item 3: Objection to Title.

In response to item 3 of the Action, the original title is amended to delete "AND APPARATUS" therefrom, in view of the Examiner's observation that "no apparatus claim(s) remain(s)." It is submitted that the new title is now clearly indicative of the invention to which the claims are directed and that the objection to the title should be withdrawn.

Item 4: 35 USC § 112, ¶1 Rejection of Claim 2.

Item 4 of the Action rejects claim 2 under 35 USC § 112, ¶ 1 for allegedly containing subject matter not described in the specification...(etc.)." The rejection is respectfully traversed.

The specification provides precise literal support for the recitation of "stretching atop a stage" at page 18, lines 1-6:

> Further, in this case, prior to the imaging step S106 the resin 22 is stretched across the rotary plate 56 in a step S104, and the surface area of the resin 22 spread across the top of the rotary plate 56 after the imaging step S106 is measured in a step S108.

(Emphasis added.)

Note further the description of "rotary plate (stage) 56..." at page 17, line 16 supporting the recitation of a "stage" in claim 2 at page 31, line 21 and see both Figs. 3 and 4 and the description of same at page 17, line 8 through page 20, line 10.

Note particularly the description at page 18, lines 24-27:

> During a dry run, depending on the state of rotation of the rotary plate 56, centrifugal force causes the extruded resin 22 to elongate across the surface of the rotary plate 56 in the step S104. The spread resin 22 develops into a thin disc-like shape.

(Emphasis added)

Thus, the further recitation of the second paragraph of claim 2/1 of "the resin developed atop the stage..." (emphasis added) likewise has precise literal support in the specification.

Accordingly, it is submitted that the subject matter of claim 2 is fully supported under 35 USC § 112, ¶ 1 in the specification and drawings and that the rejection should be withdrawn.

Item 5: Rejection of claims 1 and 2 under 35 USC § 102(b) for anticipation by JP6-120276.

Item 6: Rejection of claim 3 under 35 USC § 103(a) for obviousness over JP6-120276 ('JP '276).

The aforesaid rejections are respectfully traversed.

The subject matter of the present invention is to provide a method of applying a predetermined amount of resin on a printed circuit board. As set forth in amended claim 1, the method of the present invention has the feature of applying the resin on the printed circuit board, spreading the resin by a centrifugal force, and measuring the amount of the resin applied on the surface of the printed circuit board by measuring the area of the resin thus spread as a result of the centrifugal force.

More specifically, according to the present invention, the area of spread of the resin is not limited to that on the printed circuit board; further, the amount of the resin applied on the

surface of the printed circuit board is evaluated by measuring the area of spread of the resin.

Contrary to the present invention, the JP '276 reference uses a substrate provided with a depression defined by a step, and the resin is applied to the depressed region of the substrate. Further spreading of the resin, outside the depression, is prevented by the step surrounding the depression. Hence, the area over which of the resin is spread is limited; further, the amount of the resin applied on the surface of the substrate is measured by measuring the thickness of the resin on the depressed region.

Contrary to the reference, the present invention does not restrict the area of the resin on the surface of the printed circuit board. Associated therewith, no stepped structure is provided so as to define a depressed part, in the case of the present invention.

Thus, in the present invention, the resin is spread by centrifugal force by rotating the substrate so that the resin is spread over the surface of the printed circuit board in a uniform thickness. The method of the JP '276 reference is unrelated to the process of applying a resin in accordance with the invention as claimed herein.

Further, the Examiner's "position" as to the interpretation of "stretching atop a stage" has been shown above to be incorrect, since the above phrase and the specific term "stretching" have been shown hereinabove to have a very clear meaning in the subject specification, further distinguishing the invention over JP '276.

It is submitted that amended claim 1 is clearly patentable over the JP '276 reference and that claim 3/1 likewise is patentable, by virtue of depending from claim 1 and further in view of the patentable distinctions of the claim 3/1 recitations.

In fact, JP '276 teaches applying the resin "while moving the nozzle in x-y directions above the chip so as to provide ... a coating of uniform thickness ...." – a "teaching-away" from the present invention.

This technique of JP '276 is contrary to the invention, in which a measured amount of resin is extruded from a nozzle of the resin application device, in the form of a ball (specification at pages 16-17), which is initially attached at a top part thereof to the nozzle; thereafter, the nozzle is lowered and a bottom part of the ball becomes attached to the printed wiring board and thereupon is separated from the nozzle of the resin application device by raising the latter.

Further significant features of the invention arise from the spreading of the resin by centrifugal force, in that the spreading, or stretching, function thereof produces a uniform layer -

- which permits measuring only the diameter of the layer and, through use of a correlation table, determining the actual coating amount. (pp. 18-19).

New dependent claims 13-16 address these patentably distinguishing features.

Item 6: Rejection of claims 6 and 7 under 35 USC § 103(a) as being unpatentable over JP6-120276 in view of Nakasu et al.

Claim 6 is amended in the foregoing so as to more clearly address patentable features of the present invention.

JP6-120276 is distinguished over for the reasons asserted above as to claim 1.

Nakasu discloses a method of controlling solder bump formation on the basis of a detection signal from a level detector. Thus, the teaching of Nakasu is inherently a different technology from that of JP6-120276, which evaluates the amount of the resin on a substrate by monitoring the thickness of the resin layer which already forms a coating on the substrate. There is absolutely no motivation for combining the teaching of Nakasu with the teaching of JP6-120276.

No prima facie obviousness of the combination has been shown. Further, even when combined, the respective subject matters of claim 6 and claim 7 are not suggested or rendered obvious by the combination.

New dependent claims 17 to 20, depend from claim 6 and new dependent claims 21 to 24, depending from claim 7 correspond to new dependent claims 13-17, respectively.

Conclusion

It is respectfully submitted that the pending claims 1, 3, 6 and 7 and the new dependent claims 13 to 24 patentably distinguish over the references and rejections of record and, there being no other objections or rejections, that the claims are in condition for allowance, which action is earnestly solicited.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: July 15, 2002

By: _____
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE TITLE:

Please AMEND the Title, as follows:

RESIN COATING METHOD [AND APPARATUS]

IN THE CLAIMS:

Please AMEND the following claims:

1. (ONCE AMENDED) A resin coating method for applying [resin to] a predetermined amount of resin [region of] on a printed wiring board, comprising [the steps of]:

applying a resin on a printed wiring board;

spreading said resin on said printed wiring board by a centrifugal force; [and]

imaging an external appearance of the resin extruded from a resin application device; and

automatically adjusting an amount of the resin extruded from the resin application device based on [the external appearance] a surface area of the resin obtained in the imaging step.

Please CANCEL claim 2.

3. (ONCE AMENDED) the resin coating method as claimed in claim 1, wherein the imaging step comprises:

exposing the resin to light of a predetermined wavelength so as to fluoresce the resin; and

separating fluorescent light so generated from light of other wavelengths to obtain a fluorescent image of the resin.

6. (ONCE AMENDED) A resin coating method for applying [resin to] a predetermined amount of resin [region of] on a printed wiring board, comprising [the steps of]:

imaging an external appearance of a resin drop after the resin drop has been extruded from a nozzle of a resin application device but before the resin drop contacts the printed wiring

board; and

adjusting a distance between a tip of the nozzle and the printed wiring board based on the external appearance of the resin drop obtained in the imaging step.

7. (ONCE AMENDED) A resin coating method for applying a predetermined amount of resin [to a predetermined region of] on a printed wiring board, comprising [the steps of]:

imaging a residual amount of the resin on an extrusion nozzle of a resin application device from which the resin is expelled; and

washing the nozzle when the residual amount exceeds a predetermined amount.

Please add the following NEW claims:

13. (NEW) A resin coating method as recited in claim 1, further comprising:

applying the resin by extruding same from a nozzle of the resin application device, the extruded resin being in the form of a ball attached at a top part thereof to the nozzle and displaced above and separated from the printed wiring board.

14. (NEW) A resin coating method as recited in claim 13, further comprising:

lowering the nozzle so as to attach a bottom part of the ball to the printed wiring board and raising the nozzle so as to separate same from the ball.

15. (NEW) A resin coating method as recited in claim 14, wherein the imaging is performed by measuring the diameter of the resin.

16. (NEW) A resin coating method as recited in claim 14, further comprising:

spreading the resin ball to a uniform thickness layer; and

determining the amount of the applied resin in accordance with the measured diameter and a correlation table relating to the latter to an amount.

17. (NEW) A resin coating method as recited in claim 6, further comprising:

applying the resin by extruding same from a nozzle of the resin application device, the extruded resin being in the form of a ball attached at a top part thereof to the nozzle and displaced above and separated from the printed wiring board.

18. (NEW) A resin coating method as recited in claim 17, further comprising:

lowering the nozzle so as to attach a bottom part of the ball to the printed wiring board and raising the nozzle so as to separate same from the ball.

19. (NEW) A resin coating method as recited in claim 18, wherein the imaging is performed by measuring the diameter of the resin.

20. (NEW) A resin coating method as recited in claim 18, further comprising:

spreading the resin ball to a uniform thickness layer; and

determining the amount of the applied resin in accordance with the measured diameter and a correlation table relating to the latter to an amount.

21. (NEW) A resin coating method as recited in claim 7, further comprising:

applying the resin by extruding same from the nozzle of the resin application device, the extruded resin being in the form of a ball attached at a top part thereof to the nozzle and displaced above and separated from the printed wiring board.

22. (NEW) A resin coating method as recited in claim 21, further comprising:

lowering the nozzle so as to attach a bottom part of the ball to the printed wiring board and raising the nozzle so as to separate same from the ball.

23. (NEW) A resin coating method as recited in claim 22, wherein the imaging is performed by measuring the diameter of the resin.

24. (NEW) A resin coating method as recited in claim 22, further comprising:

spreading the resin ball to a uniform thickness layer; and

determining the amount of the applied resin in accordance with the measured diameter and a correlation table relating to the latter to an amount.